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THE HELMINTHS OF WILD PREDATORY MAMMALS OF UKRAINE. CESTODES

V. V. Kornyushin, E. I. Malyshko (Varodi), A. M. Malega

Schmalhausen Institute of Zoology, NAS of Ukraine,
B. Chmielnicky str., 15, Kyiv, 01601 Ukraine
E-mail: veresk@bigmir.net

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The Helminths of Wild Predatory Mammals of Ukraine. Cestodes. Kornyushin V. V., Malyshko (Varodi) E. I., Malega A. M. — Data related to cestodes (totally 17 species), registered in predatory mammals in Ukraine are given and summarized. The richest cestode fauna was found in the Polissya region (Zhitomir, Kiev, Chernigov, Sumy Oblasts), Carpathian region and Transcarpathia. A wide host range characterizes the majority of cestodes occurring in predatory mammals of Ukraine. They are registered in both canines (Canidae) and felines (Felidae). Cestodes of the fox (9 species) and wolf (11 species) were studied more comprehensively. Other species of predatory mammals were infected with 1 to 3 species of cestodes.

Key words: predatory mammals, canines, felines, mustelids, cestode fauna, Ukraine.

Гельминты диких хищных млекопитающих Украины. Цестоды. Корнюшин В. В., Малышко (Вароди) Э. И., Малега А. М. — Приведены и обобщены данные, касающиеся цестод (всего 17 видов), зарегистрированных у диких хищных млекопитающих в Украине. Самая богатая цестодофауна отмечена в полесских областях (Житомирская, Киевская, Черниговская, Сумская), Карпатском регионе и Закарпатье. Большинство цестод, встречающихся у хищных млекопитающих Украины, характеризуются широким кругом хозяев и регистрируются как у псовых, так и у кошачьих. Наиболее полно изучена цестодофауна лисицы (зарегистрировано 9 видов цестод) и волка (зарегистрировано 11 видов цестод), остальные виды хищних млекопитающих исследованы в меньшем количестве (обнаружено 1–3 вида цестод).

Ключевые слова: дикие хищные млекопитающие, псовые, кошачьи, куньи, цестодофауна, Украина.

Introduction

Predatory mammals play an important role in biocenoses. They hold the top of the trophic pyramid taking an active part in food chains, mainly of "prey-predator" type. This is what determines their place in circulation of parasites, in particular, helminths in ecosystems. As a rule, predatory mammals are definitive hosts of many species of helminths in which life cycle domestic animals, humans, game ungulates, lagomorphs, and rodents are intermediate hosts. Intermediate hosts often develop severe diseases that are potentially lethal. It is also belong to humans in full (echinococcosis, alveococcosis, etc.). However, despite the significant epidemiological and epizootological importance the helminth infection of the wild predatory mammals of Ukraine has remained very poorly studied. There was no any information about modern situation with helminth contamination of this group of hosts in different regions in Ukraine. Our studies are filling this gap to a certain extent.

There are few publications about parasite infection of wild predatory mammals of Ukraine. Most of them are the results of sporadic or accidental collections. Only two detailed papers were published on the base of a large quantity of collected materials based on dedicated long-term research.

First of all this is the monograph of Kadenatsii A. N. "The helminth fauna of the Crimea's mammals and the experience of rehabilitation of domestic animals from main helminthoses" (1957). Besides other domestic and wild animals in different nature-geographic zones of the Crimea five species of wild predators were studied. Cestodes were found in three of them — in a fox, a badger and a stone marten. Eleven species of cestodes were registered. In addition there is a big article by Korneev A. P. and Koval V. P. "On the studies of helminth fauna of fur-bearing animals of Ukraine" (1958). This paper summarizes the results of twelve-year research during which helminthes were collected from wolves, foxes and raccoon dogs hunted in different regions of Ukraine. Six species of cestodes were found.

Only seven species were listed in “Keys to helminths of predatory mammals of the USSR” (Kozlov, 1977) with Ukraine and the Crimea as the region of distribution. Mainly they are references to Kadenatcii’s works. In addition, the “Keys” mentions 11 more species of cestodes, and their distribution was described as “overall”. However, the structure of the “Keys” is such that it is impossible to associate the data about wild and domestic carnivores with certain region of Ukraine.

Our previous paper (Kornyushyn et al., 1999) covers results of processing the helminths collections from predatory mammals of Ukraine. For years (1962–1995) they have been accumulated in the collection of Parasitology Department of I. I. Schmalhausen Institute of Zoology of National Academy of Sciences of Ukraine. Nine species of cestodes were registered for wild predators of Ukraine. The data about helminthes of wild cat are in the paper of Kornyushin V. V. and Varodi E. I. (2010). The information about these species is included in this paper with the note “The Institute of Zoology of Ukraine collection” (SIZK).

Material and methods

Task-oriented collection of helminths of wild predatory mammals of Ukraine has been carried out by us since 1998. We have also studied the materials which were provided by helminthologists and mammologists during this period of time (Shevchenko L., Domnych V., Yemets A., Zvegintsova N. and others). In addition, we studied accidental collection materials preserved in the Parasitology Department of the Institute of Zoology.

For identification of cestodes we used “Key to Helminths of Predatory Mammals of the USSR” (Kozlov, 1977), Foundations of Cestology (Abuladze, 1964), monograph of V. Kontrimavichus “Helminth fauna of the mustelids and ways of its forming” (1969) and other publications.

By now the helminths found in 260 specimens of predatory mammals belonging to 14 species have been processed. Cestodes were found in 9 host species: wolf (*Canis lupus* L.), fox (*Vulpis vulpis* L.), racoon dog (*Nyctereutes procyonoides* L.), jackal (*Canis aureus* L.), forest cat (*Felis silvestris* L.), lynx (*Lynx lynx* L.), american mink (*Mustela vison* L.), marten (*Martes martes* L.), badger (*Meles meles* L.).

No cestodes were found in the stone marten (*Martes foina* Erxleben, 1977) — 7 individuals, the weasel (*Mustela nivalis* L., 1766) — 6 individuals, the ermine (*Mustela erminea* L, 1758) — 2 individuals, степной хорек (*Mustela eversmani* Lesson, 1827) — 2 individuals and the otter (*Lutra lutra* L, 1758) — 3 individuals.

Results

Seventeen cestode species were registered. Some specimens of cestodes were identified to a generic level only (*Mesocetoides* sp. and *Taenia* sp.).

Class CESTODA
Order PSEUDOPHYLLIDEA
Family DIPHYLLOBOTHRIIDAE s. 1.

1. Spirometra erinaceieuropei (Rudolphi, 1819)

Hosts and distribution

Definitive hosts: Wolf: P (*prevalence*) — 9.38 ± 5,15%, I (*intensity of infection*) — 1–15 (9 — *mean intensity*) sp. (speciments), A — (*abundance*) 0.84 sp., Zhitomir oblast, Chernigiv oblast; **Racoon dog:** P — 7.14 ± 6.88%, I — 2.1 sp., A — 0.15 sp.; Kyiv oblast (Chornobyl Exclusion Zone); **Forest cat:** P — 1/6, I. I. 3 sp., A. 0.05 sp.; Odesa oblast.

Paratenic hosts: Racoon dog: P — 42.86 ± 13,23%, I. I. 3–25 (8.67) sp., A. 4.0 sp.; Kyiv oblast (Chernobyl Exclusion Zone); **Marten**: P — 1/4, I. I. 13 sp., A. 3.25 sp.; Kyiv oblast (Chernobyl Exclusion Zone); **American mink:** P — 69.23 %, I. I. 1–9 (4.33) sp., A. 3.0 sp.; Kiev oblast (Chernobyl Exclusion Zone).

Order CYCLOPHYLLIDEA
Family MESOCESTOIDIDAE

2. Mesocestoides lineatus (Goeze, 1782)

Hosts and distribution

Fox: P — 39.16 ± 3,79%, I — 1–254 (37.31) sp., A — 14.61 sp., Volynska, Rivne, Zhitomir, Kyiv, Chernigiv, Lviv, Sumy, Cherkasy, Odesa, Mykolaiv, Kherson, Zapo-

rizhzhia oblasts, Crimea, and also SIZK collection (Kyiv, Sumy, Zaporizhzhia, Kherson, Odesa oblasts); **Wolf:** P — 28.13 ± 7.95%, I — 1–7 (344) sp., A — 0.97 sp.; Zaporizhzhia, Kherson oblasts; **Jackal:** P — 1/1, I — 5 sp., A — 5.0 sp.; Odesa oblast; **Forest cat:** P — 1/6, I — 132 sp., A — 22 sp.; Kirovograd oblast; **Badger:** P — 1/3, I — 24 sp., A — 8.0 sp.; Kherson oblast.

3. Mesocestoides litteratus **(Batsch, 1786)**

Host and distribution
Fox: P — 0.60 ± 0,6, I — 1 sp.; SIZK collection, Kherson oblast.

4. Mesocestoides **sp.**

Racoon dog: P — 7.14 ± 6,88%, I — 1 sp., A — 0.08 sp.

Family DIPYLIDIIDAE (Leuckart, 1863)

5. Dipylidium caninum (L., 1758)

Host and distribution
Wolf: P — 3.13 ± 3,08%, I — 1 sp., A — 0.03 sp.; Kyiv oblast.

Family TAENIIDAE Ludwig, 1866

6. Echinococcus granulosus (Batsch, 1786)

Host and distribution
Wolf: E. I. 6.25 ± 4,28%, I — 151–1335 (743) sp., A — 46.44 sp.; Chernigiv oblast, Sumy oblast.

7. Echinococcus multilocularis (Leuckart, 1863)

Host and distribution
Fox: P — 3.01 ± 1,33%, I — 25–731 (171.6) sp., A — 5.17 sp.; Lviv oblast, Volynska oblast.

8. Fimbriataenia martes (Zeder, 1803)

Host and distribution
Marten: P — 1/4, I — 1 sp., A — 0.25 sp.; Zhitomir oblast.

9. Fimbriataenia mustelae (Gmelin, 1790)

Host and distribution
Polecat: P — 1/1, I — 1 sp.; SIZK collection (Mykolaiv oblast).

10. Hydatigera taeniaeformis (Batsch, 1786)

Host and distribution
Fox: P — 0.60 ± 0.60%, I — 2 sp., A — 0,012 sp.; SIZK collection (Zakarpatska oblast); **Forest cat:** P — 4/6, I — 4–12 (6.5) sp., A — 4.33 sp.; Zakarpatska and Kirovohrad oblasts, SIZK collection (Zakarpatska oblast).

11. Multiceps multiceps (Leske, 1780)

Hosts and distribution
Wolf: P — 9.38 ± 5.15%, I — 2–8 (4.33) sp., A — 0.41 sp.; Zakarpatska oblast, Kyiv oblast (Chornobyl Exclusion Zone), SIZK collection (Zakarpatska oblast); **Jackal:** P — 1/1, I — 6 sp.

12. ***Multiceps serialis*** (Gervais, 1847)

Host and distribution

Wolf: P — 9.38% ± 5.15, I — 3–7 (5.67) sp., A — 0.53 sp.; Zhitomir oblast.

13. ***Multiceps skrjabini*** (Popov, 1937)

Host and distribution

Fox: P — 0.60 ± 0.60%, I — 1 sp., A — 0.006 sp.; Chernigiv oblast.

14. ***Taenia cervi*** Christiansen, 1931

Hosts and distribution

Fox: P — 0.60 ± 0.60%, I — 1 sp., A — 0,06 sp.; SIKZ collection (Zakarpatska oblast); **Wolf:** P — 3.13 ± 3.08%, I — 1 sp., A — 0.03; SIZK collection (Zakarpatska oblast).

15. ***Taenia crassiceps*** (Zeder, 1880)

Hosts and distribution

Fox: P — 21.08 ± 3.17%, I — 1–89 (18.65) sp., A — 3.93 sp.; Zakarpatska, Zhitomir, Kyiv, Chernigiv, Sumy, Lviv, Poltava oblasts, Crimea, SIZK collection — Sumy and Kherson oblasts; **Wolf:** P — 6.25 ± 4.28%, I — 4–5 (4.5) sp., A — 0.28 sp.; Zhitomir and Zaporizhzhia oblasts, also SIZK collection — Kherson oblast; **Racoon dog:** P — 7, 14 ± 6,88%, I — 1 sp., A — 0.077; Kyiv oblast.

16. ***Taenia hydatigena*** (Pallas, 1766)

Hosts and distribution

Fox: P — 0.60 ± 0.60%, I — 5 sp., A — 0.03 sp., Rivne oblast; **Wolf:** P — 37.5 ± 8,56%, I — 1–13 (5.0) sp., A — 1.88; Zakarpatska, Volynska, Zhitomir, Chernigiv, Sumy, Zaporizhzhia and Ivano-Frankivsk oblasts.

17. ***Taenia pisiformis*** (Bloch, 1780)

Hosts and distribution

Wolf: P — 3.13 ± 3.08%, I — 77 sp., A — 2.41 sp.; Zhitomir oblast; **Lynx** (Lynx lynx): P — 1/1. I — 2 sp.; Zhitomir oblast.

18. ***Taenia*** **sp.**

Hosts and distribution

Fox: P — 0.60 ± 0.60%, I — 1 sp., A — 0.006 sp.; Kyiv and Kherson oblasts; **Wolf:** P — 3.13 ± 3.08%, I — 1 sp., A — 0,03 sp.

19. ***Tetratyrotaenia polyacantha*** (Batsch, 1786)

Hosts and distribution

Fox: P — 25.90 ± 3.40%, I — 1–135 (18,72) sp., A — 4.85 sp.; Zakarpatska, Lviv, Volynska, Zhitomir, Kyiv, Chernigiv, Cherkasy, Sumy and Poltava oblasts, Crimea, also SIZK collection — Zakarpatska, Kyiv, Poltava and Sumy oblasts; **Wolf:** P — 6.25 ± 4.28, I — 5–35 (20) sp., A — 1.25 sp.; Zhitomir and Kyiv oblasts (Chornobyl Exclusion Zone).

We studied helminth fauna of wild predatory mammals in the northern and the western parts of Ukraine more completely. The richest cestode fauna was observed in the Polissia region. Eleven species of cestodes were registered there, among them

8 species in Zhitomir oblast, 6 species in Chernigiv oblast, 5 species in Kyiv oblast and 5 species in Sumy oblast. Nine cestode species were found in the Carpathian Region, 7 of them were registered in the Transcarpathia.

Among cestodes of predatory mammals Taeniidae of mustelids (Mustelidae) are notable for their relatively narrow specificity. Most of cestodes occurring in predatory mammals of Ukraine are characterized by wide host range. They are registered both in canines (Canidae) and in felines (Felidae). The definitive host range is determined primarily by ecological factors, essentially by trophic relations, i. e. the presence of potential intermediate or paratenic hosts (rodents, lagomorphs, ungulates, etc.) of specific species of cestodes in the food spectrum of specific species of predators in a particular area. Explicit preferences in the choice of definitive hosts — predatory mammals of certain species are known for some cestode species belonging to Taeniidae. Experimental studies showed, that *H. taeniaeformis* a common parasite of cats, does not reach maturity in dogs, as a rule (Kurbet, 1987). However, mature cestodes of this species are frequently registered in foxes. At the same time, it is typically impossible to infect cats with *E. granulosus* larvae experimentally grown from eggs taken from dogs (Abuladze, 1964). In nature foxes and arctic foxes (but not the dogs) are definitive hosts of *E. multilocularis.*

According to our records, the widest host range was registered in *M. lineatus.* Five species of definitive hosts represented all three families (canines, felines, mustelids). This is the most widespread cestode species of predatory mammals in Ukraine that was found in 12 oblasts and in the Crimea. Another species, *S. erinaceieuropei,* was found in three host species from two families (canines and felines), and *T. crassiceps* was found in three species of canines. The latter species is widely distributed and was found in 9 oblasts and the Crimea. Other species of this family were registered in one or two host species. Among them we registered a wide area of distribution for *T. polyacantha* (9 oblasts and Crimea) and *T. hydatigena* (9 oblasts). Their hosts are the fox and the wolf. We can also mention *H. taeniaeformis*, which was found in the fox and the forest cat in Transcarpathia.

Cestodes of the fox (166 individuals examined, of which 115 (69.06%) were infected) and the wolf (32 individuals examined, 28 (87.5%) infected) were studied more comprehensively. Nine species of cestodes were registered in the fox, 11 — in the wolf (table 1). Fourteen raccoon dogs were studied, 8 of them were infected with cestodes (57.14%).

Table 1. Species composition of cestode fauna in wild predatory animals of the Canidae family from Ukraine (based on original studies and published records)

Таблица 1. Видовой состав цестод диких хищных млекопитающих семейства Canidae в Украине (по собственным и литературным данным)

N	Cestode species	Wolf	Fox	Raccoon dog	Jackal
1	*D. caninum*	+	+		
2	*D. rossicum*		+		
3	*E. granulosus*	+	+		
4	*E. multilocularis*		+		
5	*H. taeniaeformis*		+		
6	*M. multiceps*	+	+		+
7	*M. serialis*	+	+		
8	*M. skrjabini*		+		
9	*T. cervi*	+	+		
10	*T. crassiceps*	+	+	+	
11	*T. hydatigena*	+	+		
12	*T. pisiformis*	+	+		
13	*T. polyacantha*	+	+		
14	*M. lineatus*	+	+	+	+
15	*M. litteratus*		+		
16	*S. erinaceieuropei*	+		+	
	Total:	11	15	3	2

The cestode fauna structure in wolf and red fox was substantially different (fig. 1). Species occurring in fox compose two well-separated groups based on their infection rates. The core of cestode fauna is comprised of three species, two of which may be considered as sub-dominant (*M. lineatus* and *T. polyacantha*), and the other one (*T. crassiceps*) is a usual parasite of this host. Murine rodents are the source of infection for these cestodes. Other 6 species are rare or occasional parasites of foxes. *E. multilocularis* occupies a special place. It locally occurs in Ukraine and is quite common in Volynsk and Lvov oblasts (P = 25 %). Rodents, preliminarily voles, are intermediate hosts of this species. Cestodes related to ungulates as intermediate hosts are among the remaining species, they may be regarded as occasional parasites of foxes.

Cestode fauna of wolf has different structure. Distribution of species based on the rate of the host infection is more even. The core is composed of 5 species out of 11 cestodes observed in wolf in present study. Two of them are sub-dominant (*T. hydatigena* and *M. lineatus*), three are common (*S. erinaceieuropei*, *M. serialis, M. multiceps*). All these species either use ungulates as intermediate hosts (*T. hydatigena, M. multiceps*), or have a wide range of paratenic hosts (*M. lineatus, S. erinaceieuropei*); larvae of *M. serialis* develop in hares. Six species may be considered as rare or occasional in this host. Infrequent infection of wolves with *E. granulosus* apparently is due to low infection prevalence of this species in wild boars (5.2 %; after Yemets, 2003). Rodents and lagomorphs as intermediate hosts of *T. polyacantha, T. crassiceps, T. pisiformis* apparently are not usual in wolves' diet. *T. cervi* is locally distributed, occurring only in Transcarpathian region.

Some cestode species were not found in wolves and foxes during the present study, or were rarely recorded in these hosts. Rareness of *D. caninum* in our records may be due to the fact that young animals, and especially young-of-the-year individuals, were almost not investigated. This gap should be filled by future studies.

Among 13 studied specimens of american mink 9 were infected with cestodes. Fewer individuals of other species of predatory mammals were studied; they were infected with 1 to 3 species of cestodes. Only plerocercoids of *S. erinaceieuropei* were found in the american mink (*Mustela vison* L.).

Below is the list of cestodes according to their host species:

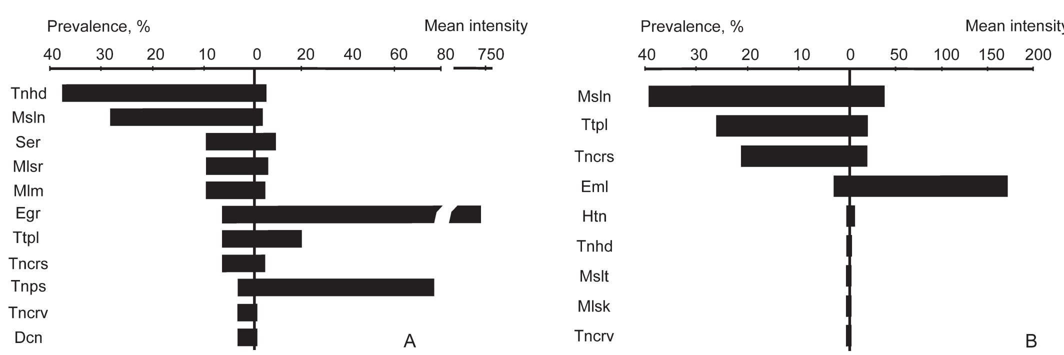


Fig. 1. Structure of the cestode fauna of wolf and red fox in Ukraine (original data): A — wolf; B — red fox. Msln — *M. lineatus*, Mslt — *M. litteratus*, Dcn — *D. caninum*, Egr — *E. granulosus*, Eml — *E. multilocularis*, Htn — *H. taeniaeformis*, Mlm — *M. multiceps*, Mlsr — *M. serialis*, Mlsk — *M. skrjabini*, Tncrv — *T. cervi*, Tncrs — *T. crassiceps*, Tnhd — *T. hydatigena*, Tnps — *T. pisiformis*, Ttpl — *T. polyacantha*, Ser — *S. erinaceieuropei*.

Рис. 1. Структура цестодофауны волка и лисицы в Украине (по нашим данным): A — волк; B — лисица. Msln — *M. lineatus*, Mslt — *M. litteratus*, Dcn — *D. caninum*, Egr — *E. granulosus*, Eml — *E. multilocularis*, Htn — *H. taeniaeformis*, Mlm — *M. multiceps*, Mlsr *M. serialis*, Mlsk — *M. skrjabini*, Tncrv — *T. cervi*, Tncrs — *T. crassiceps*, Tnhd — *T. hydatigena*, Tnps — *T. pisiformis*, Ttpl — *T. polyacantha*, Ser — *S. erinaceieuropei*.

Wolf (*Canis lupus* L.): 1. *Spirometra erinaceieuropei*; 2. *Mesocestoides lineatus*; 3. *Dipylidium caninum*; 4. *Echinococcus granulosus*; 5. *Multiceps multiceps*; 6. *M. serialis*; 7. *Taenia cervi*; 8. *T. crassiceps*; 9. *T. hydatigena*; 10. *T. pisiformis*; 11. *Tetratirotaenia polyacantha*.
Fox (*Vulpis vulpis* L.): 1. *Mesocestoides lineatus*; 2. *M. litteratus*; 3. *Alveococcus multilocularis*; 4. *Hydatigera taeniaformis*; 5. *Multiceps skrjabini*; 6. *Taenia cervi*; 7. *T. crassiceps*; 8. *T. hydatigena*; 9. *Tetratirotaenia polyacantha*.
Racoon dog (*Nyctereutes procyonoides* L.): 1. *Spirometra erinaceieuropei*, *S. erinaceieuropei* l.; 2. *Mesocestoides* sp.; *Taenia crassiceps*.
Jackal (*Canis aureus* L.): 1. *Mesocestoides lineatus*; 2. *Multiceps multiceps*.
Forest cat (*Felis silvestris* L.): 1. *Spirometra erinaceieuropei*; 2. *Mesocestoides lineatus*; 3. *Hydatigera taeniaformis*.
Lynx (*Lynx lynx* L.): 1. *Taenia pisiformis*.
Badger (*Meles meles* L.): 1. *Mesocestoides lineatus*.
Marten (*Martes martes* L.): 1. *Fimbriataenia martes*; 2. *Spirometra erinaceieuropei* l.
Polecat (*Mustela putorius* L.): 1. *Fimbriataenia mustelae*.
American mink (*Mustela vison* L.): 1. *Spirometra erinaceieuropei* l.

Discussion

Among cestods registered in wild predatory mammals in the present study, there are some species that have epidemiological and epizootological significance.

These are, first of all, *E. granulosus* and *E. multilocularis* which are liable to cause severe human diseases. The increasing population of wolves allows to presume that the wolf will be involved more actively in the circulation of *E. granulosus* in Ukraine. Meanwhile, the fox is the main final (definitive) host for *E. multilocularis* in Central Europe. Fast growth of fox population in Ukraine gives reason to prognosticate appearance of local cases of human alveococcosis (Kharchenko et al., 2008). Only imported cases of this disease have been registered in Ukraine so far.

All aforementioned information gives ground to confirm the necessity of constant monitoring of helminths infection rates in wild canines. Furthermore, they are also definitive hosts of cestodes that cause serious diseases of domestic and game ungulates. Besides echinococcosis (*E. granulosus*), cenurosis (*M. multiceps*), cysticercosis (*T. hydatigena*) and sparganosis (*Spirometra erinaceieuropei*) were often registered. The latter disease was recently recorded in pigs in Ukraine (Pozhivil, Gorzheev, 2001). In addition, cestode *T. pisiformis* causes rabbit and hare cysticercosis. Therefore, monitoring of current parasitological situation with regard to helminthoses common for wild predatory mammals, domestic animals and humans still remains an actual problem.

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Abuladze K. I. Taeniata — the Tapeworms of Animals and Humans and Diseases caused by them / Foundations of Cestodology. — Moscow : Nauka, 1964. — Vol. 4. — 530 p. — Russian : *Абуладзе К. И.* Тениаты — ленточные гельминты животных и человека и вызываемые ими заболевания.

Kadenatcii A. I. The Helminth fauna of the Crimea's Mammals and the experience of rehabilitation of domestic and wild animals hygienics from basic helminthoses. — Omsk, 1957. — 157 p. — Russian : *Каденации А. Н.* Гельминтофауна млекопитающих Крыма и опыт оздоровления домашних животных от основных гельминтозов.

Kharchenko V. A., Kornyshin V. V., Varodi E. I., Malega M. O. Occurrence of Echinococcus multilocularis (Cestoda, Taeniidae) in red foxes (*Vulpes vulpes*) from Western Ukraine // Acta Parasitologica, 2008. — **53**, N 1. — P. 36–40.

Kontrimavichus V. L. Helminth fauna of the mustelids and ways of their forming. — Moscow : Nauka, 1969. — 432 p. — Russian : *Контримавичус В. Л.* Гельминтофауна куньих и пути ее формирования.

Korneev A. P., Koval V. P. On the studies of helminth fauna of fur-bearing animals of Ukraine // Collection of works of the helminthology. — M., 1958. — P. 161–166. — Russian : *Корнеев А. П., Коваль В. П.* К изучению гельминтофауны пушных зверей Украинской ССР.

Kozlov D. P. Key to Helminths of Predatory Mammals of the USSR. — M., 1977. — 275 p. — Russian : *Козлов Д. П.* Определитель гельминтов хищных млекопитающих СССР.

Kornnyushin V. V., Varodi E. I. Helminths domestic and wild cats in Ukraine // Scientific journal of National University of bioresearches and management of natural researches of Ukraine. — 2010. — **151**. Ser. "Veterinary medicine, quality and safety of animal produce". — P. 2. — P. 113–118. — Ukraine : *Корнюшин В. В., Вароді Е. І.* Гельмінти свійського та дикого кота в Україні.

Kornyushin V. V., Sharpilo L. Y., Yemets A. M. et al. On the helminth fauna of domestic and wild predatory mammals of Ukraine // Materials of research and practical conference of parasitologists, National Agrarian University, the 3–5th of November, 1999. — Kiyv, 1999. — P. 90–93. — Russian : *Корнюшин В. В., Шарпило Л. Д., Емец А. М. и др.* К гельминтофауне домашних и диких хищных млекопитающих Украины.

Kurbet A. V. Biological and morphological features of the tapeworms Taenia pisiformis (Bloch, 1780) and Hydatigera taeniaeformis (Batsch, 1786) according to species of their hosts : Thesis of Candidate of Biological Sciences Dissertation. — Erevan, 1987. — 26 p. — Russian : *Курбет А. В.* Биологические и морфологические особенности ленточных гельминтов Taenia pisiformis (Bloch, 1780) и Hydatigera taeniaeformis (Batsch, 1786) в зависимости от вида хозяев.

Pozhivil A., Gorzheev V. Sparganosis of pigs // Veterinary medicine of Ukraine. — 2001. — N 5. — P. 29. — Ukrainian : *Поживіл А., Горжеєв В.* Спарагнозис свиней.

Yemets A. M. Strain membership of Ehinococcus granulosus in northern-eastern part of Ukraine and the peculiarities of its circulation in conditions of the region: Thesis of Candidate of Biological Sciences Dissertation. — Kyiv, 2003. — 22 p. — Ukrainian : *Ємець О. М.* Штамова належність Ehinococcus granulosus Північно-східної України та особливості його циркуляції в умовах регіону.